

## LABORATORY REPORT

November 15, 2012

Tim Pool  
Aquaterra Environmental Solutions, Inc.  
13 Executive Dr., Suite 1  
Fairview Heights, IL 62208

**RE: Cottonwood Hills 2012 Flare Sampling / 4733.11**

Dear Tim:

Enclosed are the results of the samples submitted to our laboratory on November 14, 2012. For your reference, these analyses have been assigned our service request number P1204684.

All analyses were performed according to our laboratory's NELAP and DoD-ELAP-approved quality assurance program. The test results meet requirements of the current NELAP and DoD-ELAP standards, where applicable, and except as noted in the laboratory case narrative provided. For a specific list of NELAP and DoD-ELAP-accredited analytes, refer to the certifications section at [www.caslab.com](http://www.caslab.com). Results are intended to be considered in their entirety and apply only to the samples analyzed and reported herein.

Columbia Analytical Services, Inc. dba ALS Environmental (ALS) is certified by the California Department of Health Services, NELAP Laboratory Certificate No. 02115CA; Arizona Department of Health Services, Certificate No. AZ0694; Florida Department of Health, NELAP Certification E871020; New Jersey Department of Environmental Protection, NELAP Laboratory Certification ID #CA009; New York State Department of Health, NELAP NY Lab ID No: 11221; Oregon Environmental Laboratory Accreditation Program, NELAP ID: CA200007; The American Industrial Hygiene Association, Laboratory #101661; United States Department of Defense Environmental Laboratory Accreditation Program (DoD-ELAP), Certificate No. L11-203; Pennsylvania Registration No. 68-03307; TX Commission of Environmental Quality, NELAP ID T104704413-12-3; Minnesota Department of Health, NELAP Certificate No. 362188; Washington State Department of Ecology, ELAP Lab ID: C946; State of Utah Department of Health, NELAP Certificate No. CA01527Z012-Z; Los Angeles Department of Building and Safety, Approval No: TA00001. Each of the certifications listed above have an explicit Scope of Accreditation that applies to specific matrices/methods/analytes; therefore, please contact me for information corresponding to a particular certification.

If you have any questions, please call me at (805) 526-7161.

Respectfully submitted,

**ALS | Environmental**

Digitally Signed By Sue Anderson at 1:06 pm, Nov 15, 2012

Sue Anderson  
Project Manager

Client: Aquaterra Environmental Solutions, Inc. Service Request No: P1204684  
Project: Cottonwood Hills 2012 Flare Sampling / 4733.11

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## CASE NARRATIVE

The samples were received intact under chain of custody on November 14, 2012 and were stored in accordance with the analytical method requirements. Please refer to the sample acceptance check form for additional information. The results reported herein are applicable only to the condition of the samples at the time of sample receipt.

### Sulfur Analysis

The samples were analyzed for twenty sulfur compounds per ASTM D 5504-08 using a gas chromatograph equipped with a sulfur chemiluminescence detector (SCD). All compounds with the exception of hydrogen sulfide and carbonyl sulfide are quantitated against the initial calibration curve for methyl mercaptan.

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*The results of analyses are given in the attached laboratory report. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. dba ALS Environmental (ALS) is not responsible for utilization of less than the complete report.*

*Use of Columbia Analytical Services, Inc. dba ALS Environmental (ALS)'s Name. Client shall not use ALS's name or trademark in any marketing or reporting materials, press releases or in any other manner ("Materials") whatsoever and shall not attribute to AALS any test result, tolerance or specification derived from ALS's data ("Attribution") without ALS's prior written consent, which may be withheld by ALS for any reason in its sole discretion. To request ALS's consent, Client shall provide copies of the proposed Materials or Attribution and describe in writing Client's proposed use of such Materials or Attribution. If ALS has not provided written approval of the Materials or Attribution within ten (10) days of receipt from Client, Client's request to use ALS's name or trademark in any Materials or Attribution shall be deemed denied. ALS may, in its discretion, reasonably charge Client for its time in reviewing Materials or Attribution requests. Client acknowledges and agrees that the unauthorized use of ALS's name or trademark may cause ALS to incur irreparable harm for which the recovery of money damages will be inadequate. Accordingly, Client acknowledges and agrees that a violation shall justify preliminary injunctive relief. For questions contact the laboratory.*

# DETAIL SUMMARY REPORT

Client: Aquaterra Environmental Solutions, Inc.  
Project ID: Cottonwood Hills Flare Sampling 2012 / 4733.11

Service Request: P1204684

Date Received: 11/14/2012  
Time Received: 09:50

ASTM D5504-01 - Sulfur Bag

Client Sample ID	Lab Code	Matrix	Date Collected	Time Collected	
CWH-8	P1204684-001	Air	11/13/2012	14:48	X
CWH-10	P1204684-002	Air	11/13/2012	14:54	X
CWH-12	P1204684-003	Air	11/13/2012	15:00	X

2655 Park Center Drive, Suite A  
Simi Valley, California 93065  
Phone (805) 526-7161  
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle  
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

CAS Project No.	PH04684
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Company Name & Address (Reporting Information) Aquaterra Environmental Solutions Inc. 13 Executive Dr. Suite 1 Fairview Heights IL 62208				Project Name Cottonwood Hills Floor Sampling 2012				Analysis Method				
Project Manager Tim Pool				Project Number 4733.11				P.O. # / Billing Information				
Phone 618-628-2001		Fax 618-628-2001		Sampler (Print & Sign) Tim Pool				Comments e.g. Actual Preservative or specific instructions				
Email Address for Result Reporting tpool@aquaterra-env.com												
Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code #- AC, SC, etc.)	Flow Controller ID (Bar code #- FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume	Atm D55061 total sulfur compds			
CWH-8	X	11-13-12	1448	X	X	X	X	1L	X			
CWH-10	X	11-13-12	1454	X	X	X	X	1L	X			
CWH-12	X	11-13-12	1500	X	X	X	X	1L	X			
<b>Report Tier Levels - please select</b>												
Tier I - Results (Default if not specified) _____				Tier III (Results + QC & Calibration Summaries) _____				EDD required Yes / No				Project Requirements (MRLs, QAPP)
Tier II (Results + QC Summaries) _____				Tier IV (Data Validation Package) 10% Surcharge _____				Type: _____				
Relinquished by: (Signature) _____		Date: 11-13-12		Time: 1600		Received by: (Signature) _____		Date: 11/14/12		Time: 0950		
Relinquished by: (Signature) _____		Date:		Time:		Received by: (Signature) _____		Date:		Time:		
Cooler / Blank Temperature _____ °C												



### Sample Acceptance Check Form

Client: Aquaterra Environmental Solutions, Inc. Work order: P1204684  
 Project: Cottonwood Hills Flare Sampling 2012 / 4733.11  
 Sample(s) received on: 11/14/12 Date opened: 11/14/12 by: MZAMORA

**Note:** This form is used for all samples received by CAS. The use of this form for custody seals is strictly meant to indicate presence/absence and not as an indication of compliance or nonconformity. Thermal preservation and pH will only be evaluated either at the request of the client and/or as required by the method/SOP.

	Yes	No	N/A
1 Were <b>sample containers</b> properly marked with client sample ID?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2 Container(s) <b>supplied by CAS</b> ?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3 Did <b>sample containers</b> arrive in good condition?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Were <b>chain-of-custody</b> papers used and filled out?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Did <b>sample container labels</b> and/or tags agree with custody papers?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Was <b>sample volume</b> received adequate for analysis?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7 Are samples within specified holding times?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Was proper <b>temperature</b> (thermal preservation) of cooler at receipt adhered to?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
9 Was a <b>trip blank</b> received?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10 Were <b>custody seals</b> on outside of cooler/Box?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were custody seals on outside of sample container?	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Location of seal(s)? _____ Sealing Lid?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were signature and date included?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were seals intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11 Do containers have appropriate <b>preservation</b> , according to method/SOP or Client specified information?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a client indication that the submitted samples are <b>pH</b> preserved?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Were <b>VOA vials</b> checked for presence/absence of air bubbles?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the client/method/SOP require that the analyst check the sample pH and <u>if necessary</u> alter it?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12 <b>Tubes:</b> Are the tubes capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Do they contain moisture?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13 <b>Badges:</b> Are the badges properly capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Are dual bed badges separated and individually capped and intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Lab Sample ID	Container Description	Required pH *	Received pH	Adjusted pH	VOA Headspace (Presence/Absence)	Receipt / Preservation Comments
P1204684-001.01	1.0 L Tedlar Bag					
P1204684-002.01	1.0 L Tedlar Bag					
P1204684-003.01	1.0 L Tedlar Bag					

Explain any discrepancies: (include lab sample ID numbers): \_\_\_\_\_

## RESULTS OF ANALYSIS

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**Client:** Aquaterra Environmental Solutions, Inc.  
**Client Sample ID:** CWH-8  
**Client Project ID:** Cottonwood Hills Flare Sampling 2012 / 4733.11

CAS Project ID: P1204684  
 CAS Sample ID: P1204684-001

**Test Code:** ASTM D 5504-08  
**Instrument ID:** Agilent 6890A/GC13/SCD  
**Analyst:** Wade Henton/Jennifer Young  
**Sampling Media:** 1.0 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 11/13/12  
**Time Collected:** 14:48  
**Date Received:** 11/14/12  
**Date Analyzed:** 11/14/12  
**Time Analyzed:** 11:06, 11:26  
**Volume(s) Analyzed:** 0.10 ml(s)  
 0.050 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	420,000	140	300,000	100	D
463-58-1	Carbonyl Sulfide	3,500	120	1,400	50	
74-93-1	Methyl Mercaptan	16,000	98	8,100	50	
75-08-1	Ethyl Mercaptan	750	130	290	50	
75-18-3	Dimethyl Sulfide	25,000	130	9,900	50	
75-15-0	Carbon Disulfide	2,900	78	930	25	
75-33-2	Isopropyl Mercaptan	8,200	160	2,600	50	
75-66-1	tert-Butyl Mercaptan	1,700	180	470	50	
107-03-9	n-Propyl Mercaptan	320	160	100	50	
624-89-5	Ethyl Methyl Sulfide	220	160	70	50	
110-02-1	Thiophene	10,000	170	3,000	50	
513-44-0	Isobutyl Mercaptan	520	180	140	50	
352-93-2	Diethyl Sulfide	300	180	82	50	
109-79-5	n-Butyl Mercaptan	ND	180	ND	50	
624-92-0	Dimethyl Disulfide	480	96	130	25	
616-44-4	3-Methylthiophene	420	200	110	50	
110-01-0	Tetrahydrothiophene	ND	180	ND	50	
638-02-8	2,5-Dimethylthiophene	ND	230	ND	50	
872-55-9	2-Ethylthiophene	ND	230	ND	50	
110-81-6	Diethyl Disulfide	ND	120	ND	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.

## RESULTS OF ANALYSIS

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**Client:** Aquaterra Environmental Solutions, Inc.  
**Client Sample ID:** CWH-10  
**Client Project ID:** Cottonwood Hills Flare Sampling 2012 / 4733.11

CAS Project ID: P1204684  
 CAS Sample ID: P1204684-002

**Test Code:** ASTM D 5504-08  
**Instrument ID:** Agilent 6890A/GC13/SCD  
**Analyst:** Wade Henton/Jennifer Young  
**Sampling Media:** 1.0 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 11/13/12  
**Time Collected:** 14:54  
**Date Received:** 11/14/12  
**Date Analyzed:** 11/14/12  
**Time Analyzed:** 11:40, 12:00  
**Volume(s) Analyzed:** 0.10 ml(s)  
 0.0050 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,400,000	1,400	970,000	1,000	D
463-58-1	Carbonyl Sulfide	4,400	120	1,800	50	
74-93-1	Methyl Mercaptan	17,000	98	8,900	50	
75-08-1	Ethyl Mercaptan	690	130	270	50	
75-18-3	Dimethyl Sulfide	27,000	130	11,000	50	
75-15-0	Carbon Disulfide	3,000	78	950	25	
75-33-2	Isopropyl Mercaptan	8,800	160	2,800	50	
75-66-1	tert-Butyl Mercaptan	1,900	180	510	50	
107-03-9	n-Propyl Mercaptan	470	160	150	50	
624-89-5	Ethyl Methyl Sulfide	330	160	110	50	
110-02-1	Thiophene	14,000	170	4,000	50	
513-44-0	Isobutyl Mercaptan	780	180	210	50	
352-93-2	Diethyl Sulfide	200	180	54	50	
109-79-5	n-Butyl Mercaptan	230	180	63	50	
624-92-0	Dimethyl Disulfide	740	96	190	25	
616-44-4	3-Methylthiophene	640	200	160	50	
110-01-0	Tetrahydrothiophene	ND	180	ND	50	
638-02-8	2,5-Dimethylthiophene	ND	230	ND	50	
872-55-9	2-Ethylthiophene	ND	230	ND	50	
110-81-6	Diethyl Disulfide	ND	120	ND	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.



## RESULTS OF ANALYSIS

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**Client:** Aquaterra Environmental Solutions, Inc.  
**Client Sample ID:** CWH-12  
**Client Project ID:** Cottonwood Hills Flare Sampling 2012 / 4733.11

CAS Project ID: P1204684  
CAS Sample ID: P1204684-003

**Test Code:** ASTM D 5504-08  
**Instrument ID:** Agilent 6890A/GC13/SCD  
**Analyst:** Wade Henton/Jennifer Young  
**Sampling Media:** 1.0 L Tedlar Bag  
**Test Notes:**

**Date Collected:** 11/13/12  
**Time Collected:** 15:00  
**Date Received:** 11/14/12  
**Date Analyzed:** 11/14/12  
**Time Analyzed:** 12:16, 12:36  
**Volume(s) Analyzed:** 0.10 ml(s)  
0.0050 ml(s)

CAS #	Compound	Result $\mu\text{g}/\text{m}^3$	MRL $\mu\text{g}/\text{m}^3$	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	1,400,000	1,400	1,000,000	1,000	D
463-58-1	Carbonyl Sulfide	3,500	120	1,400	50	
74-93-1	Methyl Mercaptan	14,000	98	7,100	50	
75-08-1	Ethyl Mercaptan	660	130	260	50	
75-18-3	Dimethyl Sulfide	22,000	130	8,500	50	
75-15-0	Carbon Disulfide	2,400	78	780	25	
75-33-2	Isopropyl Mercaptan	7,300	160	2,300	50	
75-66-1	tert-Butyl Mercaptan	1,500	180	420	50	
107-03-9	n-Propyl Mercaptan	240	160	77	50	
624-89-5	Ethyl Methyl Sulfide	ND	160	ND	50	
110-02-1	Thiophene	11,000	170	3,200	50	
513-44-0	Isobutyl Mercaptan	500	180	140	50	
352-93-2	Diethyl Sulfide	ND	180	ND	50	
109-79-5	n-Butyl Mercaptan	270	180	72	50	
624-92-0	Dimethyl Disulfide	690	96	180	25	
616-44-4	3-Methylthiophene	410	200	100	50	
110-01-0	Tetrahydrothiophene	ND	180	ND	50	
638-02-8	2,5-Dimethylthiophene	ND	230	ND	50	
872-55-9	2-Ethylthiophene	ND	230	ND	50	
110-81-6	Diethyl Disulfide	ND	120	ND	25	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

D = The reported result is from a dilution.



## RESULTS OF ANALYSIS

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**Client:** Aquaterra Environmental Solutions, Inc.  
**Client Sample ID:** Method Blank  
**Client Project ID:** Cottonwood Hills Flare Sampling 2012 / 4733.11

CAS Project ID: P1204684  
CAS Sample ID: P121114-MB

Test Code: ASTM D 5504-08  
Instrument ID: Agilent 6890A/GC13/SCD  
Analyst: Wade Henton/Jennifer Young  
Sampling Media: 1.0 L Tedlar Bag  
Test Notes:

Date Collected: NA  
Time Collected: NA  
Date Received: NA  
Date Analyzed: 11/14/12  
Time Analyzed: 10:02  
Volume(s) Analyzed: 1.0 ml(s)

CAS #	Compound	Result µg/m <sup>3</sup>	MRL µg/m <sup>3</sup>	Result ppbV	MRL ppbV	Data Qualifier
7783-06-4	Hydrogen Sulfide	ND	7.0	ND	5.0	
463-58-1	Carbonyl Sulfide	ND	12	ND	5.0	
74-93-1	Methyl Mercaptan	ND	9.8	ND	5.0	
75-08-1	Ethyl Mercaptan	ND	13	ND	5.0	
75-18-3	Dimethyl Sulfide	ND	13	ND	5.0	
75-15-0	Carbon Disulfide	ND	7.8	ND	2.5	
75-33-2	Isopropyl Mercaptan	ND	16	ND	5.0	
75-66-1	tert-Butyl Mercaptan	ND	18	ND	5.0	
107-03-9	n-Propyl Mercaptan	ND	16	ND	5.0	
624-89-5	Ethyl Methyl Sulfide	ND	16	ND	5.0	
110-02-1	Thiophene	ND	17	ND	5.0	
513-44-0	Isobutyl Mercaptan	ND	18	ND	5.0	
352-93-2	Diethyl Sulfide	ND	18	ND	5.0	
109-79-5	n-Butyl Mercaptan	ND	18	ND	5.0	
624-92-0	Dimethyl Disulfide	ND	9.6	ND	2.5	
616-44-4	3-Methylthiophene	ND	20	ND	5.0	
110-01-0	Tetrahydrothiophene	ND	18	ND	5.0	
638-02-8	2,5-Dimethylthiophene	ND	23	ND	5.0	
872-55-9	2-Ethylthiophene	ND	23	ND	5.0	
110-81-6	Diethyl Disulfide	ND	12	ND	2.5	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.

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## LABORATORY CONTROL SAMPLE SUMMARY

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**Client:** Aquaterra Environmental Solutions, Inc.  
**Client Sample ID:** Lab Control Sample  
**Client Project ID:** Cottonwood Hills Flare Sampling 2012 / 4733.11

CAS Project ID: P1204684  
 CAS Sample ID: P121114-LCS

Test Code: ASTM D 5504-08  
 Instrument ID: Agilent 6890A/GC13/SCD  
 Analyst: Wade Henton/Jennifer Young  
 Sampling Media: 1.0 L Tedlar Bag  
 Test Notes:

Date Collected: NA  
 Date Received: NA  
 Date Analyzed: 11/14/12  
 Volume(s) Analyzed: NA ml(s)

CAS #	Compound	Spike Amount ppbV	Result ppbV	% Recovery	CAS	Data Qualifier
					Acceptance Limits	
7783-06-4	Hydrogen Sulfide	2,020	2,690	133	51-141	
463-58-1	Carbonyl Sulfide	1,990	2,320	117	63-147	
74-93-1	Methyl Mercaptan	1,930	2,380	123	54-156	